The Northwestern MILLER

MILLING PRODUCTION SECTION

$68 Billion Food Processing Industry Founded on 4 Little Magic Words . . .

Does . . It . . Taste . . Good . . ?

Flavors, Tastes, Odors Are Keys to Finding the Correct Answers . . .

By C. G. Harrel and Mary H. Kimball

EDITOR'S NOTE: Dr. Harrel is director of the new product ideas department of Pillsbury Mills, Inc. Miss Kimball is associate director. This article has been prepared from a more detailed paper presented before a recent meeting of the Twin Cities' branch of the American Institute of Chemical Engineers.

Perhaps some of you saw Steve Allen's interesting experiment several months ago on one of his programs. People from the audience were blindfolded to eliminate the sense of sight. Their noses were closed to eliminate the sense of smell. Then they were asked to identify several beverages. The results were interesting. Some participants were given beer to taste, but said, "This is lemonade." Others confused Coca-Cola with milk. All obviously were unable properly to identify any of the foods tasted. The experiment proved that we identify a flavor, not by taste alone, but by a combination of taste and smell. Confucius in 450 B.C. summarized this by saying:

"There is no one who does not eat or drink; but few there are who can distinguish flavors."

Dr. C. G. Harrel

Turning to Webster for a definition of "taste," we find that one way to ascertain flavor is to take a small quantity in the mouth. This is a somewhat erroneous definition, in that the actual taste is determined by the vapors reaching the nose, as we shall see later.

There are four basic tastes: Sweet, bitter, salty and sour.

The rest of our so-called "tastes" are determined by the aromas or smells arising from food. If you ever passed a large bakery in the evening and smelled the aroma of the bread as it was baked, no doubt you felt hungry for a slice. It has been definitely established that with rolls freshly baked in the home, your bread consumption is increased by two or three times the amount you would normally eat. Stimulation of the appetite is caused by the aromas coming from the warm bread. Some day research may develop a method whereby these aromas will not escape from the baking oven, but will remain trapped in a loaf of bread, being released when the bread is served. This will, indeed, be a great step forward.

In addition to the word "taste," there are other definitions we should have clearly in mind.

The word "smell" means to perceive by excitation of the olfactory nerves the odor or scent of a substance.

"Odor" is that property of a substance which affects the sense of smell. This may be either fragrant or offensive.

On the other hand, "aroma" or "fragrance" refers to a distinctly agreeable flavor or odor. We have already mentioned the pleasing "aroma" of fresh bread. We might speak of the "fragrance" of cinnamon.

"Bouquet," like fragrance, implies an agreeable aroma and refers to a special substance, such as the bouquet of wine or perfume.

Offensive Smells

"Stink" is a strong, offensive smell, a disgusting odor or stench. This particularly applies to odors produced by skunks. Experience with my Labrador hunting dog indicates that he fails to distinguish between pheasants and skunks. After much research, I have definitely determined that the civet cat stink is an oxidizable odor. If the dog is washed with a bucketful of water containing about a half pint of Hilex, the odor vanishes; it is oxidized. Be sure to rinse the dog well!

These definitions are all closely related and involve two of the five senses, i.e., 10% taste and 90% smell. The nerve endings, known as taste buds—which make the sense of taste possible—vary considerably in different animals. R. W. Moncrieff, a well-known British authority on the chemical senses, gives the following estimated numbers of taste buds in different animals (mammals):

Bat	800
Squirrel	6,000
Hare and man	9,000
Sheep and marsupials	10,000
Pig and goat	15,000
Rabbit	17,000
Ox	35,000

Quoting Dr. Moncrieff: "These numbers suggest that taste, like smell, is partly degraded in man, that the sense attained its maximum importance in our ancestors and since then has declined in importance simultaneously with the rise of visual ability."

This is undoubtedly true as primitive men depended greatly on their sense of smell for protection. The most highly developed degree of smell is probably in the dog. My Labrador has been very sick after killing a skunk; yet five minutes later, with the skunk odor still on him, he could accurately trail pheasants. If any of us had such a highly developed sense of smell, we could command a position identifying odors which would pay a salary of many thousands of dollars. Through the application of such a highly developed sense of smell, we would quickly be able to solve many problems on which research is working today.

If you read the Wall Street Journal, you no doubt will be familiar with the article on flavor research which states as follows:

"Food processors are striving for increased control over those little words which are the base of their business, i.e., 'It tastes good,' 'Flavor Research' is the way the problem is being tackled by such big concerns as General Foods, Standard Brands, H. J. Heinz and the Borden Co.

"Aid is coming from an unexpected source, the Army Quartermaster Corps. Private re-

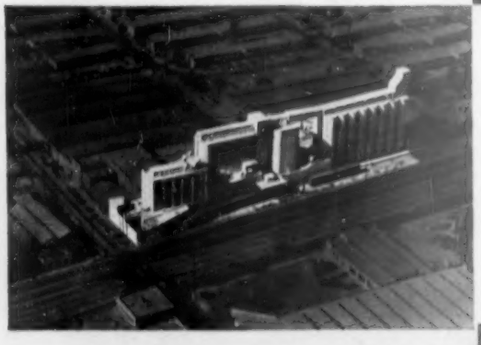
(Continued on page 14a)

Mary H. Kimball

START YOUR PROFIT PROGRAM NOW!

It is possible to maintain efficient and profitable operation without increased costs—if you use the Simon service. More and more millers are finding out that periodical replacement of outmoded equipment keeps operations at their most efficient level, regardless of the size of the mill. A modernization recommended by Simon, whether it involves one machine or a complete plant, will cut costs and increase efficiency—it's an investment in a profitable future.

Pin-pointed on the map are go-ahead mills in Canada and the U.S. that have already installed Simon plant.



The latest Simon mill in the U.S. is at the California Milling Corp's Los Angeles location (left). The pneumatic mill has a capacity of 1750 sacks per 24 hours, needs only one man to operate it on the night shift.

CONTACT THE SIMON MAN NOW

His recommendations are based on world-wide experience, high technical skill, and a thorough appreciation of your needs—and his job is to make them pay off.

H. S. 263

HENRY SIMON LTD
Stockport England

1878 Blast Sparked Day Co. Dust Control; Firm Observes 75th Anniversary

Great tragedies sometimes give way to great technological improvements, and the devastating explosion of Washburn-Crosby Co.'s A-mill in St. Anthony, Minn., May 2, 1878, is a prime example.

Out of the blast that rocked the river front came the inspiration that spurred pioneer Henry L. Day to put his brains and ingenuity to work on dust control systems for flour mills and, eventually, for many other types of business and industry.

And out of Mr. Day's inventions came the company that now bears his name, and which this month is celebrating its 75th anniversary, the Day Co.

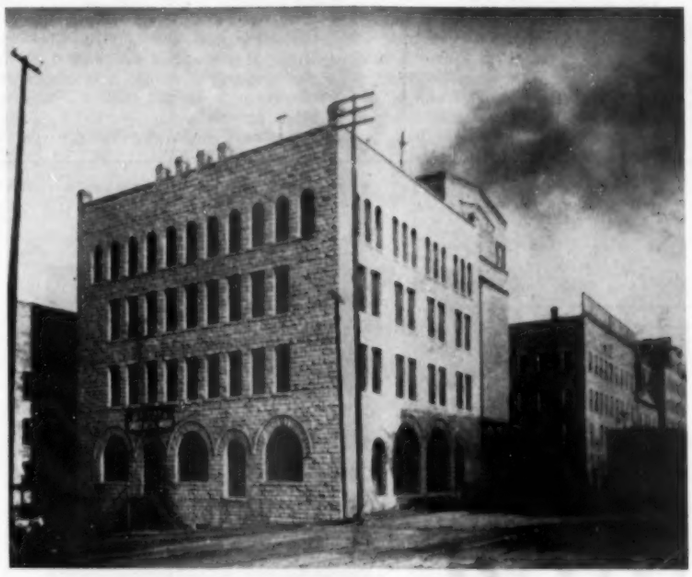
Early records are scarce, but it appears almost certain that young Mr. Day, at the age of 24, came upriver on the Mississippi from his family home in Ironton, Mich., in 1879. He probably worked in St. Paul a while before setting up a sheet metal and tin shop in St. Anthony, within earshot of the Washburn-Crosby mill that was to figure so prominently in his life.

Records disclose that Mr. Day was not a large man — about 5' 10" in height and weighing about 155 lbs., equipped with an impressive moustach, according to pictures.

Married about 1885 to Celestia Starr, he was from this time to become close personal friends with some of the leading figures of Minneapolis, particularly with John Dunwoody, brother of William Hood Dunwoody. John Dunwoody and Mr. Day roomed near one another, later owned homes as next door neighbors.

Mr. Dunwoody was a bookkeeper for the Minnesota Millers Assn. This, coupled with his close friendship with Mr. Day, is credited largely with putting Mr. Day's thoughts to dust control in flour mills, which were subject to considerable trouble in the early days.

Large saw mills and enormous grain elevators were being built rapidly. Mr. Day saw in Minneapolis an opportunity to supply these two principal types of business with sheet metal work. His experience and knowledge of air piping problems prompted him to design a dust separator as part of a dust control system for mills and elevators.



HISTORIC BUILDING—In the foreground is the old, original sheet metal shop of Henry L. Day, founder of the Day Co., manufacturers of dust-control equipment. Behind it is what is believed to be the mill which—when it exploded—spurred Mr. Day to develop his dust control machinery.

Serious Problem

In early flour mills and grain elevators dust control was a serious problem not reckoned with by many firms. Poor plant dust control (or in most cases, no dust control at all) resulted in serious explosions and fires. These disasters would wipe out the entire building or structure. The design and construction of early grain elevators contributed greatly to the dust explosion hazard. Early grain elevators were wooden buildings with a brick engine and boiler room, usually without a basement. Elevator legs were set into iron tanks. The grain bins were wooden and were open on top. Walks or galleries were built around them. Wooden spouting was used throughout. In some cases wooden spouts were connected to a dust house with provisions made for the dust to settle and for air to escape. Considerable expense was involved in removal of the dust—when it was removed at all.

When grain was transferred to or from the building the entire elevator filled with fine, choking, explosive dust. The elevator became a veritable powder keg.

Mr. Day, living and working close to the mills as he did, was constantly aware of this situation. It led to his eventual designing and fabricating of equipment to control, to separate and to handle the dust problem.

Mr. Day developed several pieces of special equipment to collect dust and to remove it by cyclonic separation from the atmosphere. The dust and chaff collected were used as fuel in those days. It was fed to furnaces by special feeding equipment also developed by Mr. Day. Soon buildings with proper dust control enjoyed reduced insurance rates and state health department commissioners began to insist that employees be given healthy, dust-free working conditions.

Firm Grows

Locations of the Day Co. in Minneapolis shifted several times. The first plant was located on the west side of St. Anthony Falls. About 1889 the plant was moved to 125 Sixth Av. So. Day dust systems spread to installations in larger numbers throughout the United States.

About 1900 Day Co. was transferred again, but still within Minneapolis. In 1900 success and acceptance were evidenced by the fact 44 of 48 elevators in Minneapolis were equipped with Day systems. Installations were made as far away as California and Liverpool, England.

By this time the advantages of dust collection had become important to a wide variety of industries. Box manufacturers, lumber companies, furniture makers, shoe companies, quarries, foundries, as well as hundreds of flour mills and elevators were utilizing dust control systems.

The firm was incorporated on June 18, 1907. Its first board of directors were H. L. Day, president; Frank H. Day, vice president, and William Day, secretary and treasurer.

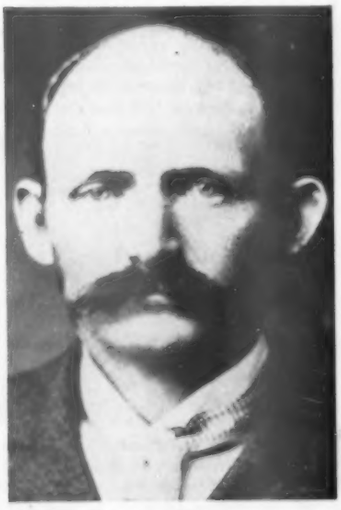
In 1914, crippled severely by arthritis, the founder began to withdraw from the growing company, and opened an office for his personal use in downtown Minneapolis.

In 1927, at the age of 72, H. L. Day, one of the pioneers who contributed so much to the improvement and safety of flour milling, died.

The present management has A. B. Osgood as president and R. E. Gorgen as sales manager.

Day Co. has plants in Minneapolis, Buffalo, New York and Ft. Worth, as well as affiliation with Day Co., Ltd., Canada. It has expanded its manufacturing to serve the bulk-material handling and bulk conveying fields.

—BREAD IS THE STAFF OF LIFE—



H. L. Day

A. B. Osgood

R. E. Gorgen

Toxicology Laboratory Built Near Chicago

CHICAGO—A new $150,000 industrial toxicology laboratory has been completed by Industrial Bio-Test Laboratories, Inc., in Northbrook, Ill., a Chicago suburb, Dr. Joseph C. Calandra, Bio-Test president, has announced.

According to Dr. Calandra, the new facilities provide industry with comprehensive biological evaluations at a time when new materials and chemicals used by the public are creating problems in public health and welfare.

The laboratories provide facilities for the evaluation of the physiological and toxicological properties of chemicals on all forms of living organisms. Quarters to accommodate all types of small and large experimental animals have been provided along with other facilities.

Control of Dust Key To Explosion Factor

By Andrew Squier

In agencies responsible for fire fighting and fire prevention there is something that is known as the fire triangle. This triangle explains the three factors that are necessary for a fire to burn. To begin with there must be something to burn, which we call material. There must be oxygen, and there must be heat, or a source of ignition. We always have oxygen in the air. In most cases it is not practical to try to remove or control the air. In fire prevention we can do much work about the heat or the source-of-ignition side of the triangle. However, most of the work in fire prevention can be done on the "material" side of the triangle.

This may sound complicated, but actually it is not. It is so simple that we hardly recognize it. Each time we light a cigarette with a match or a lighter, it demonstrates the fire triangle. Cooking our meals, making our clothes, running our industries are operations with controlled fires. We would not be able to drive our automobiles if it were not for the elements of the fire triangle. Let's take a look at how it applies to driving an automobile: On the material side of the triangle, of course, we have gasoline for fuel, and we all know what happens when we run out of gas. On the source of ignition side we have the battery, spark plugs, and the coils. When any one of these fails, we are removing one side of the fire triangle. Gas and air are mixed in the carburetor. So we see how important the triangle is, yet how careless we often are with it.

Before I mention grain dust explosions, I would like to make sure that we all have the same understanding and definition of dust explosions. According to Webster, an "explosion is a violent bursting or expansion, with noise, following the sudden production of great pressure."

With that in mind, we can say a dust explosion is a rapid burning of material which causes a rapid expansion of air which, in turn, produces "a sudden production of great pressure." The violence of an explosion depends upon the rapid burning of material. The faster it burns the greater the violence. The fastest and most violent of explosive materials today are the atomic and hydrogen bombs.

The term "explosion" as defined by law, has no fixed and definite meaning either in ordinary speech or law. It may be described, in a general way, as a sudden and rapid combustion causing violent expansion of the air and accompanied by a report. It may and does vary in degrees of intensity and in the vehemence of the report, and it is not always due to the presence of fire. It may result from decomposition or chemical action.

In our consideration of explosion, we should also consider implosion, which, for all practical purposes, is the opposite of explosion. It is the force of air rushing back to fill the vacuum created by the outgoing air of the explosion. Some experts say that the implosion does nearly as much damage as the explosion.

In some cases broken glass, doors or parts of outside walls have been found near the center of the damaged buildings. This indicates that the back draft had a very damaging force.

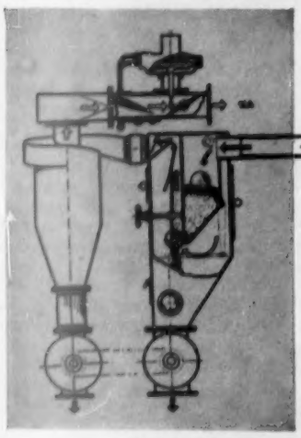
Another thing we should understand; I am keeping away from most of the technical details. Neither do I want to discuss engineering details. It is true that all explosions are alike, and it is also true they are all different. There are certain general procedures to follow, certain safe practices which must be adhered to. Each mill or elevator has its own technical details and engineering problems which should be discussed only when all the facts are available.

At Kellogg we do not consider ourselves experts in the field of dust explosions. We are the world's largest manufacturers of ready-to-eat cereals, but not the world's largest han-

(Continued on page 9a)

EDITOR'S NOTE: Mr. Squier is supervisor of plant services for the Kellogg Co., Battle Creek, Mich. This article is taken from the talk which he gave to the members of Wolverine District No. 6 of the Assocation of Operative Millers at Jackson, Mich.

FIRE TRIANGLE—Andrew Squier is pictured with the equipment used for his demonstration before the meeting of Wolverine District 6, Association of Operative Millers.



Maximum Efficiency, Minimum Space with...

BUHLER pneumatic CLEANING HOUSE SYSTEMS

(Positive or Negative Pressure)

Now cleaning house installations can be simplified and concentrated into small areas with Buhler pneumatic systems. They permit the greatest possible capacity per cubic foot of space, and can be readily installed in existing mills without major changes in the present layout.

You get easier maintenance, better accessibility, greater cleanliness and sanitation, more light, easier supervision, more room, and less risk of fire than with mechanical conveyors... and smaller dust-recovery plants are required.

Moreover, in Buhler pneumatic systems, the air conveys and also aspirates the discharged grain, removing light impurities such as dust and straw and reducing the risk of infestation. Additional aspiration takes place on each vertical lift.

Buhler systems operate entirely automatically. Installation—vertical or horizontal—is quick and inexpensive.

Write for full details

BUHLER

Buhler Brothers, Inc., U.S.A.
4207 Nicollet Avenue
Minneapolis 9, Minn.

Sprout, Waldron & Co., Inc.
26 Logan Street
Muncy, Pa.

Buhler Brothers (Canada) Ltd.
24 King St. West
Toronto 1, Ontario

FL/415

Air Recirculation System Can Be Used for Grain Fumigation

By Richard V. Burckhardt

EDITOR'S NOTE: Mr. Burckhardt is with the Dow Chemical Co., Midland, Mich. He addressed the members of Wolverine District No. 6 of the Association of Operative Millers at a recent meeting in Jackson, Mich., and this article reproduces his talk.

The need to store huge surpluses of many kinds of grain in recent years has brought attention to an old problem—insect infestation. The problem has assumed new and bigger proportions.

The use of liquid fumigants for prolonged storage, while satisfactory, has not proved the complete answer. Ventilation systems (called aeration systems in the U.S.) have been in use in western Europe since the late twenties and early thirties. This method of treating grain to prevent mustiness and to control insect propagation is, however, relatively new in the U.S.

In view of the limitations of liquid fumigants as presently used over projected periods of storage, particularly where turning is impractical, the next most logical step was the adoption of the various aeration systems for fumigation. This adaptation is very simple in principle; it consists mainly of installing a method of returning the air blown through the grain back to the fan. The first attempt at this method, now called recirculation, was in 1948 when the U.S. Department of Agriculture installed such a system in a huge oil tank to fumigate cottonseed for control of the pink bollworm. This system proved so successful that similar systems were soon installed in huge grain surplus storages such as silos, oil tanks, Quonset huts and Liberty ships. All were successfully fumigated by the recirculation of methyl bromide at a considerable saving over liquids with a higher consistent percentage of kill. Later, other fumigants were tried in recirculation systems with varying degrees of success.

The principles of recirculation, while new to this country, are derived from the experience with aeration systems located mainly in Germany. Most aeration and ventilation systems are designed on the basis of blowing 1/10 of a cu. ft. of air per bushel per min. through the grain mass. This 1/10 of a cu. ft. per min. is only a guide post to give the agricultural engineer a reference point to start with. This rate is higher than necessary for fumigation, but if you have a system designed to move this amount of air, it can be easily adapted for fumigation. However, 0.025 cu. ft. per bu. is an adequate rate for fumigation alone. Naturally, a system designed for fumigation alone costs less than one to be used for aeration.

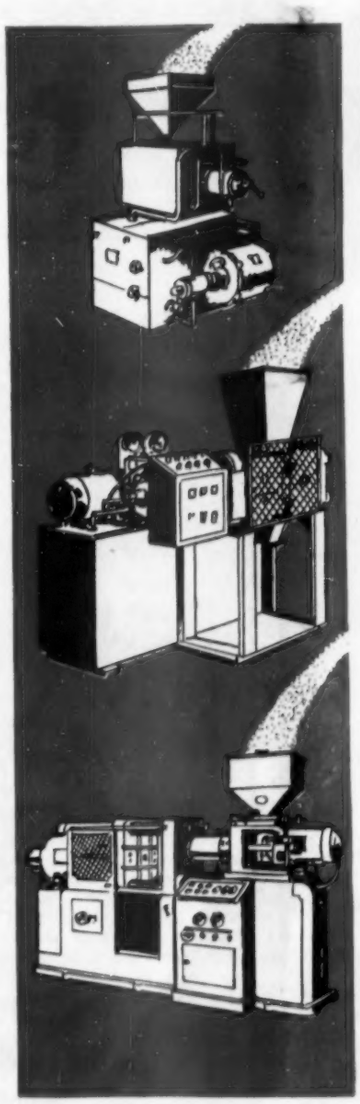
The air direction from the standpoint of fumigation can be either up through the grain mass or down; however, USDA recommends that for aeration the air penetrate downward. This is to avoid condensation of water vapor on the roof or surface layers of the grain if warm air in the grain is passed upward into cooler air above. In order to move air uniformly through a grain mass, it is necessary to have a system of duct work on the bottom of the bin to allow the air to pass through, but, at the same time, to keep out the grain. One popular type of duct work is screen-covered expanded metal. But many other types may be used.

To move equal volumes of air, the larger the duct the slower the air needs to move, which gives a lower static pressure. Conversely, to move the same volume of air through a smaller duct will increase the static pressure and air velocity. These factors in turn determine the size and type of blower horsepower of the drive motor.

If you have an aeration system, it can be readily adapted for fumigation. If not, and you wish a system for fumigation only (with a slightly lower c.f.m. capacity) this can be arranged at a small cost per bu. Even such a system at a lower c.f.m. rate may be used for aeration; however, with a lower c.f.m. rate the time for aeration will be slightly extended. A new adaptation of recirculation has been tried and proved very successful. It consists of connecting two silos at the top and bottom. By forcing air up one silo and down the other with a single fan, you can use the same equipment to fumigate two silos at almost the cost of one.

For a multiple silo installation, the use of a manifold at the top and bottom connected by a return duct will help fumigate any silo by use of a suitable valve arrangement.

A liquid fumigant can be recirculated if desired. This is done by running your recirculation system and applying liquid fumigant counter current to the air flow either by an aerosol unit, pumped through piping and spray nozzles, or pumped through



PLASTICS
START AS A POWDER

. . . and like most powders used industrially some of the granules must be sifted and graded.

Many plastic manufacturers and suppliers have found that Swiss Silk is the ideal medium for sifting their prime ingredients and mixes, particularly where uniformity of texture and speed of operation is desired.

They have found, as multitudes of millers before them, that you can't beat Swiss Silk for long runs of uniform sifting.

Industry, very wisely, follows the miller's lead when it comes to sifting, and millers the world over prefer Swiss Silk.

ASK FOR THESE TRADE NAMES

Swiss Silk

AND GET THE GENUINE

BODMER· DUFOUR· EXCELSIOR· NITEX· SCHINDLER· WYDLER

a hose and a fog nozzle, over the surface of the grain.

This method has a distinct advantage over hand application because it eliminates breathing vapors on applications. Less labor is involved and more efficient use of the fumigant is accomplished. There is less loss due to volatilization and you obtain a better distribution of the fumigant. In short, your aeration or cooling system, which you may be using to fumigate with methyl bromide, may be used for other fumigants.

What are the advantages in comparison to methyl bromide?

1. Organic residues of liquid fumigants are exempt under the Miller Bill.
2. Your fumigant can be held in a loose structure for a longer period of time.

What are the disadvantages as compared to methyl bromide?

1. The use of liquid fumigants costs most. You need extra equipment, and liquid fumigants are much harder to volatilize. More heat is needed to change it from a liquid to gaseous state.

In connection with this, information on the recirculation of liquid fumigants by G. L. Phillips of USDA will be published soon.

In conclusion, there is no mumbo jumbo or slide rule magic in a recirculation system. This system, just to fumigate, can be installed at a trifling expense per bushel. If you already have an aeration system installed, you have more than 70% of a recirculation system. All that is needed is some method of returning air to the intake side of the blower. How this is done will depend upon the type and location of your storage. Some of the advantages of recirculation, whether adopted from an aeration system or installed for this purpose, are:

1. Fumigation by recirculation is very economical.
2. It has a sure kill record with a higher percent kill over other methods.
3. A variety of fumigants can be used which includes liquids.
4. A variety of storages can be adopted.
5. Your fumigation is rapid.
6. The kill is uniform throughout the grain bins.
7. By use of your aeration system, you can reduce the turning of your grain.

Put Your Grain Fumigation Problems in Competent Hands!

Don't Forget - it takes BOTH a quality fumigant and experienced handling to get the best results from a fumigation.

Infuco - has grown to leadership in the field by providing BOTH and producing results that speak for themselves.

Remember - when you have problems, we can provide the answers.

"Where Service Backs the Salesman!"

SERVING AMERICA'S FOOD INDUSTRY

the Industrial Fumigant Company

923 STATE LINE KANSAS CITY, MISSOURI

A. E. BAXTER ENGINEERING CO.

Designers and Engineers for Mills, Elevators and Feed Mills

1311-1315 GENESEE BUILDING BUFFALO 2, NEW YORK

PAPER SACKS FOR MILLERS

The Chatfield & Woods Sack Co.

CINCINNATI, O.

LET DOTY DO IT

If Your Lab is Overloaded

Sanitation Analyses - Wheat and Flour

Doty Technical Laboratories

KANSAS CITY 13, MO.

Quality Satisfaction Service

Are Synonymous with

SHUTTLE BRAND

SILK NYLON

TRIPETTE & RENAUD FILS MFG. CO. WARRANTED SILK BOLTING CLOTH

Registered Trade Mark

Manufactured for more than a century by

TRIPETTE & RENAUD FILS MFG. CO.

Sailly-Saillisel and Paris (France)

Sole Importers for U.S.A. and Canada

F. H. PAUL & STEIN BROS. INC.

235 Fifth Avenue New York 16, N.Y.

Phone: MU 4 (Murray Hill) 6371

Distributors

J. K. Howie Co. Minneapolis, Minn.

Capital Corrugating Co. N. Kansas City, Mo.

CCC Fumigant Rules Revised

WASHINGTON—A tolerance limit for inorganic bromide residues resulting from the use of ethylene dibromide has been established at 50 parts per million of inorganic bromide, according to the Commodity Stabilization Service of the U.S. Department of Agriculture.

Therefore, CSS has instructed warehousemen holding contracts for storage of Commodity Credit Corp.-owned grain not to fumigate CCC-owned grains covered by Sec. 19 (a) of the Uniform Grain Storage Agreement with methyl bromide more than three times, unless the inorganic bromide residue has been determined as sufficiently less than the tolerance limit of 50 parts per million to permit additional fumigation. Such determination must have been made by chemical analysis.

Ethylene dibromide is commonly used as one component in liquid grain fumigant mixtures, and comprises about 5% of the mixture by volume.

Previous instructions are extended to the use of fumigant mixtures containing approximately 5% by volume of ethylene dibromide, and the number of fumigations shall be limited to six. If the fumigant history of the grain is not known, or if it has been fumigated with the above mixture a total of six times, further fumigations shall be deferred until the level of residue is determined by chemical analysis to see if further fumigation can be made without exceeding the established limit.

——BREAD IS THE STAFF OF LIFE——

Hart Bandstra Expands Duties at Richardson

CLIFTON, N.J. — Hart Bandstra has been appointed advertising manager for the Richardson Scale Co., Clifton, N.J. He will be responsible for coordinating the company's entire sales promotion program, including all advertising and publicity activities.

Mr. Bandstra is a veteran of nearly 40 years with Richardson, starting with the company in 1918. Prior to his present appointment he was service and parts manager from 1923 to 1956, serving as credit manager during the same period, as well as advertising manager from 1924 to 1948.

Hart Bandstra

Professor Claims High Yields Good Despite Surpluses

ITHACA, N.Y. — Despite the nation's wheat surplus, it remains "good business" for farmers to grow high acre yields, a New York State College of Agriculture professor says.

Prof. A. A. Johnson, a plant breeder, said, "This is so because high wheat yields result in the lowest production cost per bushel. Cost account data accumulated by Cornell's department of agricultural economics proves that production cost per unit is usually reduced by growing a high yield per acre."

Prof. Johnson said Genesee and Cornell 595 are the recommended wheat varieties. Genesee is the highest yielding and is non-shattering at harvest, but it is not quite so stiff as Cornell 595, he said.

Prof. Johnson said farmers should plant only high quality seed. Persistent rains before and during the wheat harvest season induced considerable sprouting in the head. Furthermore, some of the wheat, when harvested and stored, was high in moisture, he said.

G. E. O'Brien Named

COLUMBUS, OHIO — The Ohio Grain & Feed Dealers Assn. has appointed G. E. O'Brien, Greenville, Ohio, acting executive secretary. Mr. O'Brien will retire in January as president and general manager of O'Brien Milling Co., Greenville.

A former assistant secretary of agriculture for the state of Iowa and member of the faculty of Iowa State College, Mr. O'Brien has been with the O'Brien Milling Co. for 30 years. He has served the association for most of the 30 years he has been active in business in Ohio.

Robinson "PNEU-SPOUT"

Highest Quality, Strength and Mobility at Lowest Overall Cost!

Sanitary—Non-Corroding Aluminum Alloy Units protect the wholesomeness of your product. They are rust-proof, corrosion-free and infestation is prohibited by interlocking junction pieces. In addition, there are no "dead spots" or linings to conceal infestation. Pneu-Spout is all metal spouting—no non-metallic parts to deteriorate.

Installed Four Times Faster—Supplied ready to assemble Pneu-Spout goes up four times faster than regular mill spouting. The lightweight aluminum is easier to handle and the patented junction design eliminates the need of large stocks of tubes, bends and elbows. A hacksaw, file and a screwdriver are the only tools required for installation. Unskilled labor can handle installation and do it in a fraction of the time required for other systems.

Mobility Feature Makes Pneu-Spout Reusable, ideal for temporary spouts. Here is a big, money-saving feature that makes Pneu-Spout so popular. Reconstruction or flow changes are easily made after original erection. Pneu-Spout can be dismantled and re-erected with ease and speed. This quick "take-down" and erection feature also saves time on installation or maintenance in areas of limited space. A minute's time is all it takes to remove and re-install Pneu-Spout sections.

Strong — Rigid — Choke-Free System — Rigidity and Strength are not sacrificed in the Pneu-Spout system. A fifteen foot wheat spout running at an angle of 30° from horizontal supported a 170 pound man without being disturbed. Pneu-Spout is run directly through floors and this does away with one of the main causes of chokes in mills that are wood spouted. Blowing of dust is eliminated also because Pneu-Spout flanges and connecting junctions are virtually air tight.

FREE—Pneu-Spout Booklet gives complete information on this new and better spouting. Write toDAY for your copy.

Carried in Stock for Immediate Shipment.

The DAY Company

822 THIRD AVENUE N.E., MINNEAPOLIS 13, MINN.

Branch Plants, Buffalo and Fort Worth

Representatives in Principal Cities

DAY SINCE 1881

EXCLUSIVE U.S.A. DISTRIBUTOR FOR PNEU-SPOUT

Worth Looking Into

New Products
New Services
New Literature

This reader service department announces the development of new and improved products, new services and new literature offered by manufacturers and suppliers. Claims made in this department are those of the firm concerned. Use the accompanying coupon to obtain the desired information.

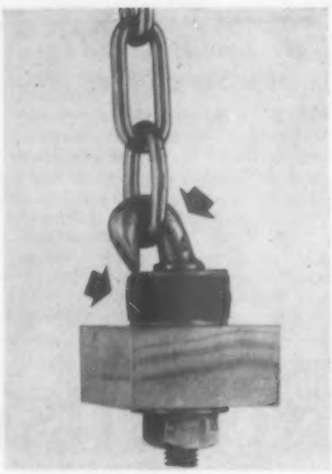
No. 4057—Sifter

The introduction of small sifters in recent years has filled a long standing need in the industry, claims Thomas Robinson & Son, Ltd. The firm is producing a new sifter, called by the trade name Robinson Mini-

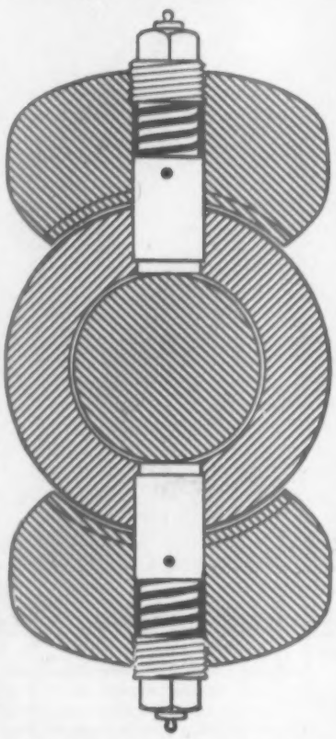
sifter, type PGm. The sifter is self contained in a base 4 ft. sq. From eight square sieves it yields 54 sq. ft. of dressing surface, allowing three distinct separations. Company officials say that the large effective dressing area makes the machine ideal for sieving large capacities through fine clothing. Other features claimed are: Positive leakproof clamping is effected by the turning of handles; sieves withdraw back or front; loose clothing frames give speedy clothing changes; change of flow necessitates only the swapping round of interchangeable sieves. There are no doors and all reciprocating movement takes place within the 4-ft. sq. base area. Simplicity in design and construction is claimed. The machine is delivered in a fully assembled state and the only installation needed is bolting it to a firm foundation and making electrical connections. Secure more details by checking No. 4057 on the coupon and mailing it to this publication.

No. 5548—Grain Shovel Devices

Two new mechanical improvements are offered by the Foster & Felter Co. and are claimed to improve the efficiency, length of service and save on man hours in operating grain



shovel machines. One is the Brooks conversion kit, a device which replaces the rope and weigh system on old-style shovel machines. Developed and perfected on the job by a Kansas City elevator superintendent, the kit has a tripping mechanism that is



adjustable to the pull and length desired. Company officials say there is no rope to confuse the direction of rotation of chain and cable and installation is simple enough to be done without stopping the shovel. The second perfection is the Brooks shovel hook, a new style hook which fastens the chain to grain shovel boards. The hook has a patented soft sponge rubber washer which holds the hook closed. The hook is made of heavy, malleable cast iron. The new type of hook eliminates the excessive breakage of hooks and grain shovel boards, it is claimed. For further information check No. 5548 on the coupon and mail it to this publication.

—BREAD IS THE STAFF OF LIFE—

LEASES TERMINAL

WINNIPEG—Saskatchewan Wheat Pool has leased National Harbors Board Terminal No. 2 at Vancouver for a 5½-year term, the board of directors announced last week. Total capacity of the terminal is estimated at 1.6 million bu.

Send me information on the items marked:

☐ No. 4057—Sifter
☐ No. 5548—Grain Shovel Devices

Others (list numbers) .....

NAME .....

COMPANY .....

ADDRESS .....

SLIP OUT — FOLD OVER ON THIS LINE — FASTEN (STAPLE, TAPE, GLUE) — MAIL

FIRST CLASS
PERMIT No. 2
(Sec. 34.9, P. L. & R.)
MINNEAPOLIS, MINN.

BUSINESS REPLY ENVELOPE
No postage stamp necessary if mailed in the United States

POSTAGE WILL BE PAID BY—

The Northwestern Miller

P. O. Box 67,

Reader Service Dept. Minneapolis 1, Minn.

FUMIGATE
With Full
CONFIDENCE

DAWSON 73
Low-Dosage
Full Strength
Spot Fumigant

GIVES FULL PROTECTION
Check These Important Points

✓ Dawson 73 is patented. It cannot be duplicated. (U. S. issues patents only on synergistic fumigant mixtures.) Which means that the special combination of ingredients has vastly superior insect killing power. The synergism of Dawson 73 is tested, proved and patented.

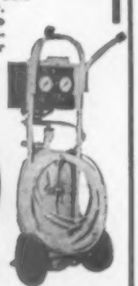
✓ Dawson 73 is the original low-dosage fumigant. Because it is powerful, less is needed and cost per treatment is lower.

✓ Dawson 73 is undiluted. It is sold at full strength. Percentage of active ingredients stated on label. Some fumigants do not state percentages. Watch your label. You get what you pay for.

APPLY EASILY
EITHER METHOD

A Available in 2-inch shot can. One can equals knock-out strength of about a quart of conventional fumigant. Just punch and pour in fumigation ports now used. No handling bottles, wasted time, broken glass. No fumigant lost. Order case of 48 cans today.

B For large mills, use "Little Squirt" applicator. Two men can fumigate average mill in two hours. Cuts costs substantially. No equipment to buy. No initial investment. Ask for details.



DAWSON
LOW-DOSAGE
FUMIGANTS

FERGUSON FUMIGANTS
810 S. Florissant Rd.,
FERGUSON 21, MISSOURI
In Canada: Kipp Kelly, Ltd., Winnipeg and Toronto

TRONA
INDUSTRIAL AND AGRICULTURAL CHEMICALS

BROMOTOX*

The LOW DOSAGE SPACE FUMIGANT for

VAULT
TARPAULIN
WAREHOUSE
MILL
BOX CAR

Assures

• MAXIMUM RESULTS
• GREATER SAFETY
• MORE ECONOMY

Bromotox, a mixture of ethylene dibromide and methyl bromide, is an effective, safe and economical space fumigant. The stronger odor and lower dosage requirements of Bromotox result in greater killing power, increased economy and maximum safety. It is longer lasting, more penetrating and leaves no residual odor. Bromotox allows positive control of granary and rice weevils, Angoumois grain moth, confused flour beetle, Mediterranean flour moth, raisin moth, cheese mites and many other pests infesting grain, flour, rice, cheese and dried fruits. Available in cans packed twelve per case as well as 10, 50, 120 and 170 pound cylinders.

*TRADE MARK AP & CC

Other Eston Fumigants:

ESTON METHYL BROMIDE
The Versatile Fumigant

M-B-C FUMIGANT
Methyl Bromide with 2% Chloropicrin

A Product of
ESTON CHEMICAL DIVISION

American Potash & Chemical Corporation

3100 E. 26th St. Los Angeles 23, Cal.

Midwestern Distributor

FERGUSON FUMIGANTS

810 S. FLORISSANT ROAD
FERGUSON 21, MISSOURI

EXPLOSION CONTROL

(Continued from page 4a)

dlers of grains. I do not want to bore you with a lot of figures or statistics, but we use, yearly, over 13 million bushels of corn, nearly a million bushels of wheat, 74 million pounds of bran, 78 million pounds of rice, and 10 million pounds of malt. Even though we use that much grain, we handle only a small percentage of the grain produced. We use other products which can cause explosions, too, in such quantities as 50 million pounds of sugar, 177 million pounds of paper, 2 million pounds of glue, 4 million pounds of wax. The dusts from these products, like grain products, are explosive unless handled properly.

There are many things to consider in dust explosions: (1) the type of material, (2) the particle size, (3) closeness to one another, or the right mixture, (4) the amount of moisture in each particle or in the air, (5) the ignition temperature of the dust particles, (6) the explosive range, or the limitation of combustibility, (7) the rate of burning, and so on down the list. When all of these conditions are just right, we have an "explosive condition." At that point all we need is a spark, a flame, or a source of ignition. The spark may come from static, from a light switch or an exploding light bulb. It could be a match, a welder's torch, or any one of many other sources of ignition.

We might say this another way: The dust particles have to be close enough so the flame will spread. They must be far enough apart to get enough air (oxygen) to burn. But when explosive dust is kicked into the air or dropped through it, the right mixture with air is bound to exist somewhere in the dust cloud for a moment or two at least. So you have the makings of an explosion or a fire.

It would be better to say explosion "and" fire, because you usually get both. In fact, if there is much dust, you usually get two explosions plus a fire. The first explosion is usually small. It kicks considerable dust into the air and then there's a big one. The "big one" may wreck an entire elevator or building.

The frequency of grain dust explosions is not very high. But when they do happen, the severity is usually very great. The loss of life is usually high. The damage to buildings and equipment is often complete destruction. In many cases it is an innocent by-stander, the factory across the street or people who live in the next block, who suffer loss of life and property.

Pressures are built rapidly. Grain dust will build a pressure from 35 to 50 pounds p.s.i., starches from 40 to 75 pounds p.s.i., sugar dust from 25 to 45 pounds p.s.i. and flours from 26 to 50 pounds p.s.i. These pressures are built by the explosions, and the damage comes quicker than you can say "dust explosions." To realize the extensive damage, we have only to look at pictures of buildings after explosions to see the reinforced concrete walls that have been blown out, some of them 18 in. thick. We can see the bent and twisted mass of steel and rubbish, or look at pictures of buildings with all the window glass gone.

I will give you some figures on explosions in the cereal industry:

The ignition temperature of corn starch is 470°. The minimum spark energy is 40 millijoules. The minimum explosive concentrations in ounces per cubic foot are .045. The maximum explosive pressure in pounds per square inch is 72.

Corn cob ground and dried has an ignition temperature of 400°. It has a minimum spark of 60 millijoules, minimum explosive concentrations in ounces per cubic foot of .030 and maximum explosive pressure in pounds per square inch of 64. These figures are reported by the U.S. Bureau of Mines and are based on minus 200 mesh dust.

Now, what is a millijoule? I wanted to know, too, so I asked one of our engineers and this is what he said: "A joule is a unit of energy which will lift one pound .73767 ft., or about 9 in. To say it another way, a joule is the energy required to lift ¾ lb. 1 ft. A millijoule is one thousandth of a joule or .00073767 foot pounds. For 40 millijoules we simply multiply by 40, then we have .00295068. That is the amount of energy required to ignite corn starch dust." So that I might understand the quantity of energy, I was told such an amount of energy would raise one pound about the thickness of a sheet of paper.

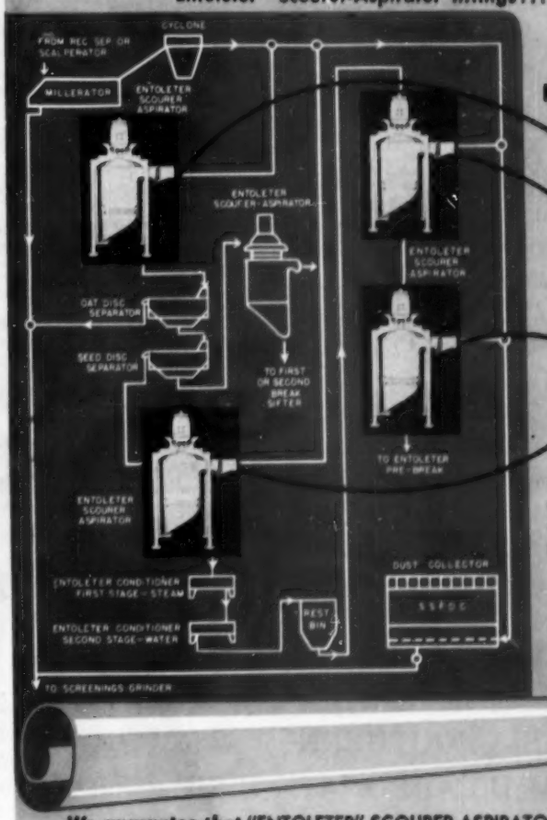
We at Kellogg are safety minded

HERE IT IS!!!

The ENTOLETER® SCOURER-ASPIRATOR Grain Cleaning System...

EFFICIENT • DEPENDABLE • EFFECTIVE

* Actual field results show a concentration of infestation in "Entoleter" Scourer-Aspirator liftings...



Fragment Count per 50 grams:

290
157
180
250

The majority of these fragments were larvae which prove that the "ENTOLETER" SCOURER-ASPIRATOR is removing the hidden infestation plus plugs... from the kernels.

We guarantee that "ENTOLETER" SCOURER-ASPIRATOR ... effectively controls internal infestation with a REDUCTION in material lost to screenings ... with desirable polishing action ... and without over-scouring.

* The flour being produced on this mill averages less than 2 fragments per 50 grams.

The trademark "ENTOLETER" is your guarantee of complete satisfaction

ENTOLETER DIVISION
SAFETY INDUSTRIES, INC.
Formerly The Safety Car Heating and Lighting Co., Inc.
P.O. Box 904 New Haven 4, Conn.

and very fire conscious. We consistently watch for fire hazards. This, of course, includes dust explosions. Even with careful watching, we have had two explosions and fires in our milling division.

Prevention Is Possible

Dust explosions can be prevented. Here again let us look at the fire triangle. We know what it takes to make an explosion. So, if we can remove or control any one of the three sides of the triangle we can prevent an explosion and fire. The "material" side offers the greatest possibilities.

High on the prevention list are housekeeping and cleaning. Mills and elevators must be clean and free from concentration known as explosive conditions. This may require new equipment or remodeling or proper ventilating of old equipment. It may mean an educational program to employees or providing proper methods and tools for cleaning. But it certainly needs the wholehearted backing and insistence of management.

Overhead pipes and beams must be kept clean. Dust or dirt if allowed to collect on them is the first and biggest step to an "explosive condition." Dust or dirt on the floor will burn but won't explode. However, it might be disturbed by the first explosion and become part of the second. At any rate, it would be ideal fuel for the fire that might follow.

Welding and cutting should be allowed only when all fire prevention measures have been taken. Under certain conditions it might require shutting down of the mill or equipment. We must also be careful when construction work is undertaken. Many times construction men do not understand the problems and hazards in milling operations. Consequently they do not use the best methods of fire prevention. The use of an "open flame permit" system will help control this source of ignition.

The proper wiring for lights, switches and motors should be seriously considered. There are many fire prevention agencies and insurance companies which will provide detailed information on approved electrical wiring and electrical equipment.

Static electricity has to be removed by permanent ground wires. Remember that static under proper conditions can cause an explosion.

Smoking should not be permitted in areas where there is any danger of dust explosions. Smoking rooms, ash trays, and metal lockers in a separate building should be provided for employees.

The proper control of insects is important, and remember that some insecticides or fumigants can explode and cause fires.

The flammability of some of the materials used in fumigants must be recognized and dealt with. Wherever possible use a fumigant that is not explosive, or keep the mixture below the explosion limits. Some dry powders will not explode until mixed with other material. Some aerosols, if improperly used, can cause fires or explosions in mills.

Provide protection against lightning. Install magnets to remove magnetic materials from the flow of the grain streams. Other equipment should be provided to remove non-magnetic materials, such as pieces of concrete or stones because they, too, can provide the spark needed for a dust explosion.

Vent Properly

Proper venting of both the equipment and building will help to reduce damage in case of an explosion by releasing the explosion pressures. The required ratio of explosion vent area depends upon the strength of the structure. Reinforced concrete, brick, and wood plank each requires different venting areas.

You can always get into a discussion, even a heated argument, about the value of fire extinguishers in a dust explosion prevention program.

These are but a few of the things needed in a good dust explosion prevention program. If you are the owner or manager of a mill, it might be well to invite the local fire chief or the fire commissioner to visit your mill. You might discuss with him part of your operation, explaining the most hazardous process and invite him to visit those areas. The firemen would also like to know something of your water supply, and they may ask about doors for removing employees from a burning building. Perhaps the firemen are not familiar with your methods of processing or working. It is well for them to know about your fire prevention or fire fighting program. After all, if you should have a fire or an explosion, it is well for the firemen to know as much as possible about your property. Normally the fire chief will receive that type of information with open arms and use it to mutual advantage.

Finally, all dust explosions are serious, even the small ones, because they indicate that explosive conditions are present, and unless corrective measures are taken, disaster will surely follow. Explosions are costly in human lives, in material, in building and equipment and in jobs.

—BREAD IS THE STAFF OF LIFE—

KANSAS ELEVATOR BURNS

PECK, KANSAS—A grain elevator belonging to Moore Grain, Inc., Wichita, Kansas, was destroyed by fire. Over 6,000 bu. of new wheat burned.

quick 'n easy—and terrific!

made with
COLUMBIA-SOUTHERN
SODIUM BICARBONATE U.S.P.
in a variety of sizes
for precise blending

The greater variety of screen sizes available in Columbia-Southern sodium bicarbonate enables you to blend your flours just right . . . exactly suited to your individual requirements.

Choose your screen from powdered, granular, or Flour Blend. Particle size for each type is uniform. If shelf life is a problem, you may find that the proper selection of sodium bicarbonate for your mix improves shelf life considerably.

Columbia-Southern "bicarb" is pure, white, free-flowing, smooth-blending. Order a supply today. You'll like it.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland
Boston • New York • St. Louis • Minneapolis • New Orleans
Dallas • Houston • Pittsburgh • Philadelphia • San Francisco
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

The AIRVEYOR®

goes up over and around ...anywhere

No matter how tortuous the route from your plant's unloading dock to storage, to processing, The Airveyor will give you trouble-free conveying of your dry pulverized or granular materials by air, with an efficiency that will cut — appreciably — your annual handling costs.

With the Airveyor system *nothing moves but the material.* There are no belts, buckets, screws or other mechanical devices to get out of order. The Airveyor flows your material through sealed pipes, by air. Inhalation and dust hazards are eliminated, and the Airveyor is self-cleaning for maximum sanitation. As there is no waste, no spillage, this alone can represent considerable savings. In addition, the Airveyor offers the dual advantages of simplicity in construction and operation—one man can direct the flow of material to any point. And after installation your only cost is for air.

Designed for use alone, or with other Fuller Systems, the Airveyor can be precisely matched to your operation, whether it is large or small. Write today for the factual story on efficient conveying by the Airveyor as the first step toward lowering the boom on the high cost of handling materials in your plant.

FULLER COMPANY GENERAL AMERICAN TRANSPORTATION

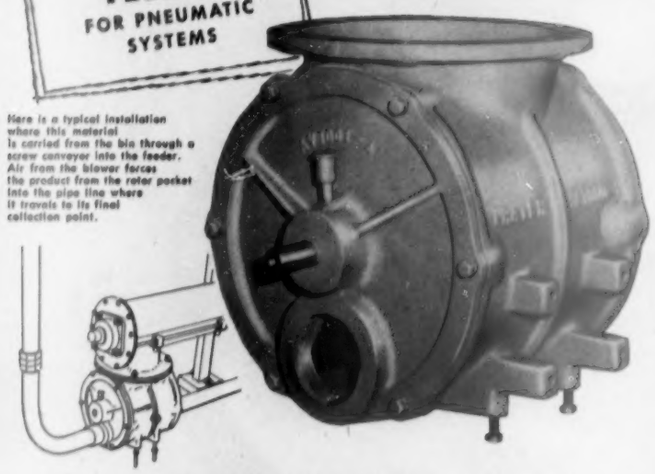
Fuller
pioneers in harnessing AIR

2014
A-220

FULLER COMPANY
156 Bridge St., Catasauqua, Pa.
A SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORP.
Chicago • San Francisco • Los Angeles • Seattle • Kansas City • Birmingham

NEW! FOR HANDLING FLOUR... FAST and EFFICIENTLY!

PRATER BLOW-THRU FEEDER FOR PNEUMATIC SYSTEMS



Here is a typical installation where this material is carried from the bin through a screw conveyor into the feeder. Air from the blower forces the product from the rotor pocket into the pipe line where it travels to its final collection point.

No matter how attritionized the product, this new Prater Blow-Thru Feeder will feed it efficiently and quickly into any pneumatic system. And this new design becomes an integrated part of the pipe line and will feed against pressures as high as 10 PSIG . . . either positive or negative!

One of the efficient design features of this unit is that on the horizontal center line of the body casing is a pressure neutralizing port to bring the rotor pockets to atmospheric pressure before filling.

There are many other interesting and high quality production features. Power requirements vary according to the fineness and abrasiveness of the product . . . flour, salt, carbon or any other material.

Available in cast iron and bronze . . . write today. Ask for our new airlock catalog, the most comprehensive in the industry!

FREE!

PRATER PULVERIZER COMPANY

1517 S. 55th Court
Cicero, Illinois

Sweden Conducts Voluntary Foods Enrichment Plan

WASHINGTON — In Sweden the enrichment of foodstuffs with vitamins and other nutrition substances is not required under law but is done voluntarily, states the Royal Swedish Embassy in Washington.

According to Swedish food regulations foodstuffs may only be enriched with such substances as have been approved for the purpose by the Board of Trade. Representatives of the Medical Board, the Veterinary Surgery Administration and the National Institute of Public Health are required to participate when an application is under consideration by the board.

Special provisions regarding the enrichment of foodstuffs with vitamins are laid down by law, in connection with the production of vitaminized foodstuffs. Under these provisions, foodstuffs may be vitaminized only upon approval by the Board of Trade. When considering an application for this purpose, the board shall have before it a report submitted by the National Institute of Public Health stating, among other things, the vitamin content and whether the commodity, particularly with regard to the vitaminization process, can be deemed to be in any way detrimental to the public health. Labels and other advertising material are examined in connection with the board's considerations.

Should the Board of Trade find that the vitaminizing is of value from the point of view of public nutrition, the board may grant permission for the vitaminization, valid for a period of not more than three years. During such period of time, the commodity is tested through the National Institute of Public Health with a view of ascertaining the vitamin content in the product. These tests are paid for by the holder of the permit.

Most wheat flour in Sweden is vitaminized so that the finished product contains 4 mg. of thiamine, 1.25 mg. of riboflavin, and 40 mg. of niacin a kilogram. The purpose of this process is, consequently, to restore to the highly-ground wheat flour the vitamin content of the original whole grain. Finely-ground wheat flour at certain mills is enriched by adding iron (ferrum reductum).

This Sasko mill at Ficksburg was recently stripped, re-floored, and given a "Pneu-Flow" conveying system. Output soared, although almost all the original machinery was re-installed.

GIVING THE MILLER WHAT HE WANTS

New mills for old

In recent years Robinsons have been called upon to undertake many remodels. Their latest machines and their unique "Pneu-Flow" and "Pneu-Spout" methods of conveying provide the exact answers to modern requirements.

Robinsons are realists; they are never above re-using efficient machinery and equipment to save capital expenditure. The Robinson organization is flexible enough to tackle and solve all remodel problems however complex. And most important, the job is finished on time.

Robinson OF ROCHDALE

THOMAS ROBINSON & SON LTD., ROCHDALE, ENGLAND

Resident Representative in U.S.A.: MICHAEL FANNING, c/o Oak Grove Hotel, 230 Oak Grove, Minneapolis, Minn.

In Canada:
KIPP KELLY LTD., 68 Higgins Avenue, Winnipeg, Manitoba, *Telephone* 92-2507

JONES-HETTELSATER CONSTRUCTION CO.
Designers and Builders for Milling Companies
1911 Baltimore Ave. KANSAS CITY 6, MISSOURI

MILL COGS
We make ALL kinds. Specialize in "Ready Dressed" cogs which are READY TO RUN the moment driven and keyed. Write for circular "DW" and instruction sheets free.
The N. P. Bowsher Co., South Bend, Ind.

SUPERIOR CARBIDE TOOLS
For All Roll Corrugating
Economical Increased Output
CORRALLOY TOOL CO.
Minneapolis 7, Minn.

Get this bonus with PY-RAN

At left, the circled tenth biscuit symbolizes the extra yield obtained from self-rising flour leavened with Monsanto PY-RAN.* At right, nine biscuits represent the limited yield when an ordinary calcium phosphate is used.

When you use Monsanto's PY-RAN in your prepared mixes and self-rising flours, your customers get greater yield from your product. This means more repeat sales for you.

Above, you see an extra biscuit, an actual bonus, resulting from PY-RAN'S superior leavening action. PY-RAN (anhydrous monocalcium phosphate) holds its leavening action for release *in the oven.* That's why it gives such light, fluffy baked goods. PY-RAN has extra-long shelf life, too, because of a special moisture-absorbent coating that protects it from reaction during storage.

You'll like PY-RAN. It blends well with other leavening acids, gives attractive texture, crust and crumb color, reduces tunneling. You'll also like SAPP-40 for machine doughnut mixes; SAPP-28, a slow-action baking acid, and HT* Phosphate (MCP monohydrate).

Phone the local Monsanto office for the book "Monsanto Phosphate Leavening Agents," or write: Monsanto Chemical Company, Inorganic Chemicals Division, 710 North Twelfth Boulevard, St. Louis 1, Missouri.

*Reg. U. S. Pat. Off.

Leavening school for Monsanto salesmen, the only one of its type in the industry.

MONSANTO

SERVING INDUSTRY...WHICH SERVES MANKIND

WORLD'S LARGEST PRODUCER OF ELEMENTAL PHOSPHORUS

Writes New Book On Grain Trading

NEW YORK—James S. Schonberg, vice president of the Uhlmann Grain Co., Chicago, has written a new book entitled "The Grain Trade: How It Works."

Publication of the book was announced recently by Exposition Press, Inc., New York.

The book is described as the most comprehensive ever written on the mechanics of merchandising and trading in cash and grain futures in the U.S. and Canada.

TASTES, FLAVORS, ODORS EXPLAINED

(Continued from page 1a)

search concerns are hard at work on investigations which involve cost-cutting as well as flavor improvement. So are similar concerns among the 37,000 or so companies in the $68 billion a year (consumer expenditures) food processing industry."

The subject of flavor is so important to our Armed Forces that the Quartermaster Food and Container Institute maintains a very competent research staff on flavor evaluation. At the end of World War II, I traveled through Germany in a jeep. Cold rations were opened and eaten as we stopped on the road. The rations had a minimum of flavor because they were cold. Many times these cold rations were eaten, only to be expelled from the stomach within a few minutes. Yet, when heated, the same rations were very acceptable. Flavors increase with temperature.

Providing our Armed Forces with foods that possess a maximum of flavor is a major problem. The flavor tempts the fighting man to eat his food. In many cases food is wasted because the flavors are not acceptable. The nutritive value of the product may be excellent, but its flavor determines whether or not it will be eaten.

Col. John D. Peterman is the commanding officer of the Quartermaster Food and Container Institute for the Armed Forces, and Dr. David R. Peryam is in charge of the flavor evaluation work there. Their offices are located in Chicago. They are carrying on excellent research, and if you are interested in the subject of flavor evaluation, it would be well worth while to visit these research facilities, as a vast amount of knowledge can be gained there.

Irradiation

Our government is spending millions of dollars on the irradiation of foods. At higher levels of treatments —such as two to three million reps —it is found that undesirable flavors or odors are developed. At Natick, Mass., the quartermaster general's office maintains an extensive research and development center. Brigadier-General C. G. Calloway is the commanding general of the Quartermaster Research and Development Command. I visited these vast units last April and I saw two instruments used to identify chemical compounds causing off-flavors and odors in irradiated foods. The first is a mass spectrometer which eventually will be made automatic. It will then only be necessary to place the sample in the instrument, turn the proper switches, and in due course, a complete analysis of the sample will be made automatically. This is a most interesting device, and costs $50,000 to $100,000.

Vapor phase chromotography was

MODERN FORSTER EQUIPMENT PAYS BETTER MILL PROFITS
Each of these Forster machines for better flour milling does a specific job superbly well. Each was originated to meet a definite need for more efficient milling and cost saving. They are profit makers. Forster machines handle milling jobs from start to finish . . . wheat scouring, conditioning, feed grinding, feed finishing, dusting . . . plus elevating and conveying equipment, dust collection systems and bins. Call Forster for profit-making mill equipment.
HAMMER MILL—4 CAPACITIES
DUSTER
CAKE FLOUR FINISHER
FEED DRESSER
CYCLONE SCOURER
WHEAT CONDITIONER
The FORSTER MFG. CO.
1425 So. McLEAN BLVD.
WICHITA 12, KANSAS

Walter B. Gillette

IN NEW POST—Walter B. Gillette has been named to the newly-created position of sales manager for the bag division of Virginia-Carolina Chemical Corp. He will work out of the New York office at 99 Park Ave. The position of sales manager was established in line with an expanding sales program for V-C multiwalls, D. H. Johnson, manager of the bag division, announced. Mr. Gillette has handled bag sales in the New York area for three years.

also used to determine undesirable compounds. Never before has the government engaged in such extensive research. For instance, when certain factors influencing flavor in pineapple were isolated and identified, 9,000 lb. of pineapple were required for the necessary analyses. Contrast this with just one onion needed to determine chemicals responsible for its off-flavors and odors. The day is not far away when some of our foods will be processed by irradiation and will not require refrigeration. (See The Northwestern Miller, Sept. 11, page 3a.)

Napoleon Bonaparte was greatly interested in flavors, and said, "A man's palate can in time become accustomed to anything." (For example, the natives of Africa consider the intestines of elephants a delicious dish!) Much progress has been made in flavor research since Napoleon's day.

Industrial organizations which supply flavorings and perfumes maintain large research facilities and pilot plants, and the progress they have made in the last three decades is almost fantastic. Today, more research and pilot plant work is being conducted on flavors for foods than at any time in history—research that applies to foods for animals as well as for man. The flavor manufacturers are to be congratulated.

Let me quote from an article entitled "Sense of Smell," written by Ruth and Edward Brecher for the February, 1956, issue of "Science News Letter":

"When you wish to sample an odor, you sniff—and this carries the odor-laden air upward to the olfactory tract. There is no need to sniff while you eat, though. As you chew your food, warm vapors are released from it; the act of swallowing and the related act of exhaling pump these flavor-laden vapors upward toward the nose.

"In general, the higher the temperature of a substance, the more molecules are given off and the more intense is the odor. This basic relationship of aroma to temperature lies at the heart of the science of food preparation. It explains why good cooks insist on serving soups and other tasty dishes piping-hot for maximum flavor. Iced tea and coffee may be refreshing to drink, but they never achieve the full-bodied flavor of hot tea or hot coffee. Indeed, professional coffee tasters insist that hot coffee and iced coffee actually have different flavors.

"The savor of frozen vegetables, fruit and other food items also depends partly on this flavor-temperature relationship. Green peas, asparagus, strawberries and other garden produce contain a variety of delectable flavor components rapidly lost at room temperature. By freezing immediately after picking, many of these flavor molecules can be 'locked in.' Hence, food processors freeze their products as quickly as possible after harvesting.

"Every natural odor or flavor, most experts believe, actually is a blend of many. In coffee, for instance, chemists have identified more than 50 flavor components and suspect that there are many more. Therefore, they speak of a 'flavor profile,' in which each component modifies your reaction to the others.

"A good cook uses this flavor profile instinctively in concocting her tastiest dishes. She adds spices and herbs in quantities too small to be identified individually, yet sufficient to achieve a striking total effect. The goal is to have guests ask, 'What did you put into this to make it so delicious?' rather than 'Mmmmm . . . ginger, isn't it?'

"Many people are extremely conservative in their flavor preferences. They object to change. Occasionally, a good company has notably improved the flavor of a product only to be deluged with complaints that 'it doesn't taste right'."

Florasynth Laboratories, Inc., has supplied us a list of 60 items in which various flavors are used.* For example:

Product — Astringents. **Chemicals used as Flavoring** — Essential oils, pure and imitation, such as: Peppermint, spearmint, cinnamon, wintergreen, sassafras, etc., certified colors.

*Because of the length of the list, we are unable to give it here in its entirety. It may be possible to obtain the complete list from Florasynth Laboratories, 600 W. Monroe St., Chicago, Ill.

Product—Baked Goods. **Chemicals used as Flavoring**—Imitation vanilla compounds, pure vanilla concentrate, dihydro vanilloin "C," citrus oils and emulsions, concentrated citrus oils, protovan, terpenless citrus oils, syntharome imitation butter oils, syntharome imitation butterscotch oil, maplearome, imitation maple flavor base, imitation rum concentrate, syntharome imitation black walnut, imitation brandy concentrate, diacetyl.

Other uses of odors are numerous. Odors can be a defensive weapon. Recently there appeared a cartoon in a Minneapolis paper in which a

● At the check-out counter of a supermarket, a member of a research team asked a lady if she'd mind answering one question. She didn't mind.

"Why do you buy X brand of flour?"

"Well, white flour all seems pretty much the same today, but *this* brand clearly assures you that vitamins have been added. See, it tells you plainly on the package 'ENRICHED FLOUR' and lists the vitamins. We buy enriched bread and other foods with vitamins—so I say why not get that health advantage in the flour I use?"

The lady is absolutely right, and millions agree with her. That's why "ENRICHED" is a selling word.

But why *"Pfizer* enriched"?

For good reasons. To begin with, Pfizer has been a vitamin research and production center since the first vitamin was commercially produced. Bi-Cap® was one of the first enrichment concentrates. And this "head start" in vitamins has continued. What this means is that Pfizer can help you with the newest developments in enrichment products.

RIGHT NOW IMPROVED PFIZER BI-CAP is made with a new type of Riboflavin which gives it a *lighter color and overcomes unsightly agglomeration.* All three forms of BI-CAP are also made with Thiamine Mononitrate for better Vitamin B_1 stability.

Continued Pfizer research in riboflavin, thiamine and other health ingredients will help you offer your customers improved flour for tomorrow's improved bread and baked goods. Look to Pfizer for the finest enrichment concentrates.

Pioneer and Leading Manufacturer of Vitamins Pfizer

CHAS. PFIZER & CO., INC.
Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Texas

herd of lions was feasting on a newly-killed animal. A hungry skunk approached the lions—but even without using his glands, the lions immediately dispersed. Long experience had taught them not to offend this small animal. The skunk is one of the few animals in the African jungle which can set the King of Beasts on the run. One shot of skunk stink will disperse a dozen lions—but a lion hunter may need three shots to kill one lion.

"Ridz" is a defensive combination of chemicals giving most unpleasant and unacceptable odors to a dog's nose. It will keep the little doggies out of your flowerbeds and off your lawn.

Almost directly opposite are odors of the alluring type. There is a pheasant scent placed on a sack filled with sawdust. This gives the essentials for training dogs for pheasant retrieving. A duck scent is also available. Both types are offered by Jerry Carnes, nationally known dog trainer. Stoeger's 47th Edition of the Shooters' Bible, 1956, page 199, lists the following animal lures: 1. Skunk; 2. Rabbit; 3. Muskrat; 4. Racoon; 5. Fox; 6. Wildcat; 7. Opossum.

Fragrances are used in all types of lotions, cosmetics and perfumes. One product widely advertised over the radio is supposed to leave a "he-man odor." It never has been clear to me just what a "he-man odor" would be. Ladies resort to use of many perfumes of various bouquets. There is a special type for brunettes, another type for blondes. There again I have not exactly determined why ladies use perfume. They are so highly specialized and developed many of them would cause a blind man to whistle.

Pleasing flavors sometimes are used to mask undesirable odors. They are often placed in wrappers or packaging material. When the customer picks up the package, a whiff of pleasing fragrance goes to him and is conducive to impulse-buying of the product. In addition, there are other special masking agents to cover undesirable odors.

Since we conclude that the taste of food is largely dependent on odor or flavor, it is logical to assume that food not having an odor does not have a taste. Such is the case with alcohol in its diluted form. Vodka has little or no taste—it leaves a negligible odor on the breath after one has imbibed. Hydrogenated vegetable shortening has no odor, resulting in a bland taste. Water for the most part has a minimum of odor and little taste.

Neutral foods quickly pick up and retain odors. This is a fact which the food industry must constantly keep in mind. Shortening, if improperly packed and exposed to onions, will immediately taste like onions. If exposed to oranges, it will take on an orange taste. Flour must not be stored near onions, garlic, oranges, soap or other odoriferous products; if it is, it becomes unfit for human consumption because of the foreign flavors it picks up.

Foreign Flavors

Other foreign flavors may affect the natural flavor of a product. The secret of dressing mutton lies in the fact that the wool must not touch the flesh; if it does, the mutton takes on an undesirable strong woolly taste and the meat is almost inedible. The deer has a scent gland in its foot. If this is immediately removed upon killing, the meat has a better and more pleasant taste.

Flavor in all its aspects, therefore, presents a very complex problem. Flavors may be classified as follows: 1. Natural; 2. Synthetic or imitation; 3. Micro-biological; 4. Disintegrated or decomposed, and 5. Enzymatic.

(1) Natural flavors are the most familiar. The U.S. Department of Agriculture at the Western Utilization Research Branch in Albany, Cal., has perfected a new process for dehydrating tomatoes which retains their natural flavor. The Thornton Canning Co. has completed a commercial plant for producing this dehydrated tomato juice. Our armed forces will use the new product extensively. It is equal in taste and quality to the average canned tomato juice.

Oil of orange, oil of cinnamon, oil of clove, oil of lemon—all are examples of natural flavors. Many are subject to decomposition, and careful attention must be paid to their proper packaging and storage.

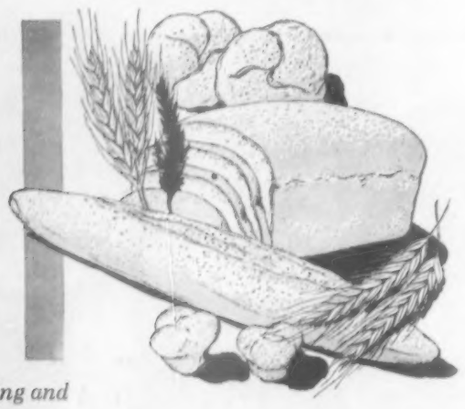
(2) Turning to synthetic or imitation flavors, there are a great many of them. Usually, they are made by synthesis. These consist of: 1. Alcohols; 2. Iso salicylates; 3. Acetates; 4. Aldehydes; 5. Acids; 6. Creosols, and 7. Laurates. There are many other similar organic compounds.

Givaudan-Delawanna, Inc., in the Givaudan Index (their supply of this unfortunately is exhausted) divide aromatic chemicals into 38 different classifications, listing some 450 chemicals. As examples:

Odor Classification of Chemicals

Classification — Carnation. **Chemicals Suitable**—Acetyl isoeugenol, alcohol C-7, amyl salicylate, benzyl isoeugenol, citronellyl acetate, eugenol, eugenol acetate, isobutyl benzoate, isoeugenol, isoeugenol phenyl acetate, methyl cinnamate, methyl eugenol, methyl isoeugenol, phenyl

FLOUR FOR MAN'S BREAD*



A Brief History of Milling and Baking by **SCIENCE WRITER**

Chapter XIII. *The Importance of Oliver Evans*

TRADITIONAL WAYS UPSET

Twenty years before the American Revolution Oliver Evans was born in Delaware. During his lifetime milling became increasingly mechanized—in no small part through his own efforts.

In view of the value of his work in advancing the art and business of milling it is interesting to note that he was not primarily a miller. He was an inventor with a variety of creations to his credit.

As has been the case so often with many who produce new ideas, his contemporaries did not quickly accept his changes.

AUTOMATIC MILLING BEGINS

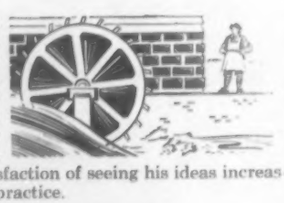
One of Oliver Evans' greatest contributions was the automatic mill. He had studied the current milling practices and discovered many operations being done by hand. There were seven: carrying in the grain, hoisting it, taking it from granary to hopper, shoveling the grist into tubs, and hoisting them, watching the bolter, mixing the bolted materials.

Evans substituted mechanization for these and other operations and in the process increased productivity by achieving a higher extraction of superfine flour from wheat.

WATER POWER, NOT MUSCLES, DID THE WORK

In effect Evans redesigned the mill, using water power to lift material to the top as often as needed so that it could flow down by gravity through various power-operated machines thus reducing hard labor.

He used power to move the material horizontally to other machinery which could operate efficiently in the available space. Optional arrangements were provided so that the miller could use one or another automatic process at his discretion. Evans introduced new ideas to milling. He made gravity work for the miller, not against him. He participated in the advances that allowed millers to increase their output substantially.



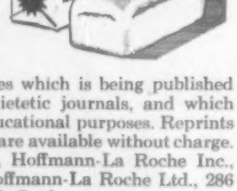
Oliver Evans had the satisfaction of seeing his ideas increasingly adopted in milling practice.

LIGHTING 15 CANDLES

Today's concept of "enrichment" of white bread and flour with vitamin B_1, vitamin B_2, niacin and iron came into being in 1941.

Fine, white bread and flour are demanded by Americans and have been for years. Millers and bakers, too, have wanted white flour because it keeps better and bakes better.

To satisfy these needs millers are obliged to mill out portions of the grain which contain valuable vitamins. Recognizing this, millers and bakers began the restoration of vitamin B_1 in the late 1930s. Later vitamin B_2, niacin and iron were included. Then, 15 years ago, the concept of "enrichment" with all of them came into being.



Roche is proud that its vitamins, which are identical chemically and in biological activity with Nature's own, have supplied so many people with health-giving nutritive elements through white bread and flour enrichment.

This is one of a series of articles which is being published in professional nutrition and dietetic journals, and which will be widely distributed for educational purposes. Reprints of this and all previous chapters are available without charge. Write to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, N. J. In Canada, Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

The next chapter titled: "New York State's Milling Cities" will be published soon.

*This is the title of a definitive history of milling by John Storck and Walter Dorwin Teague, published by the University of Minnesota Press at Minneapolis and copyrighted by the University of Minnesota. It is used with permission as a source of material for this series of advertisements.

Enriched with vitamins and iron for better nutrition

ethyl salicylate, rhodinol, rhodinyl formate

Classification — Honey. **Chemicals Suitable**—Amyl phenyl acetate, benzyl phenyl acetate, butyl phenyl acetate buxine, cinnamic alcohol, p-cresyl phenyl acetate, dimethyl hydroquinone, ethyl phenyl acetate, geranyl phenyl acetate, linalyl butyrate, methyl myristate pure, phenyl acetic acid, phenyl ethyl benzoate, phenyl methyl carbinol, phenyl ethyl phenyl acetate, rhodinyl phenyl acetate.

Research work is continuously being done on organic synthesis. We can look forward to more types of flavoring. It must be understood that one single chemical may not produce the desired flavor, but that a combination of several chemicals may be required, however.

(3) The third general class of flavorings is the micro-biological group. A vast number of food flavors are produced by action of bacteria, yeast and molds so common it is hardly necessary to mention them. The flavor of most bread, for instance, is due primarily to fermentation of yeast. In self-raising bread, the characteristic flavor is due to bacteria. Individual ingredients in bread are of a very bland nature, and without fermentation the bread would taste exceedingly flat. Beer, buttermilk, butter, wine, vinegar and hundreds of varieties of cheese are examples of flavors developed by micro-biological action.

Dr. Howard E Bauman, bacteriologist and head of the food research department, Pillsbury Mills, Inc., has prepared a list of 17 good products in which micro-biological organisms are responsible for characteristic flavor. As examples:

Product—Butter. **Flavoring Micro-Biological Organism** — Streptococcus lactis, streptococcus cremoris, lactobacillus citrovorum, lactobacillus dextranicum. **Bread**, regular baker's white bread — Saccharomyces cervesiae; salt rising bread — Saccharomyces cervesiae, lactobacillus bulgaricus, aerobacter levans; sour rye bread—Streptococcus lactis, lactobacillus bulgaricus, lactobacillus casei.

(4) Previous reference has been made to the fourth group of flavors and odors classed as decomposed or disintegrated Dehydrated cabbage is prone to develop off-flavors and odors of this type. In the packing of perishable foods, rancidity can be caused by oxidation, hydrolysis or enzyme action. All three must be guarded against. Metals such as copper and iron accelerate rancidity development. In fact, one accelerated test for the study of rancidity in foods is to mix a known weight of copper sulfate with the foods. The time required for the food to become rancid under these conditions serves as a guide to what it will do under normal conditions.

Unbleached flour will keep much longer than bleached flour. The British army uses nothing but unbleached flour because of its better keeping qualities. The flour can be matured by use of potassium bromate, which is not a bleaching agent.

Anti-oxidants developed in recent years have proved of great help in preventing certain fats and oils from becoming rancid. They are used extensively in the food industry.

Odors or flavors due to decomposition and putrefaction are, of course, caused by bacteria, wild yeast, molds and enzymes. These odors often are of such an obnoxious nature as to give us some warning that the food is spoiled, although this cannot be relied upon at all times.

(5) Proteolytic, amylolytic, lipolytic and many other enzymes have been used for ages in modifying flavors. The resulting flavorings may be either pleasing or disagreeable.

Having classified and discussed flavors, let us now consider the various forms in which flavors are obtained and used. These are: 1. Natural ground spices; 2. Soluble spices; 3. Locked-in spices; 4. Aqueous emulsions; 5. Non-aqueous emulsions; 6. Candied fruit and fruit peels; 7. Fruit crystals, and 8. Alcohol extracts.

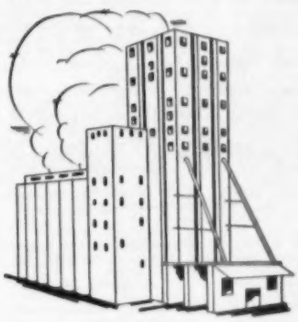
1. Natural spices (the type most commonly used in the home), although of good quality, have some disadvantages: 1. They are not uniform in strength; 2. They lose flavor on standing, and 3. They frequently become infested.

2. Soluble spices have recently been perfected. These are usually the resins which have been extracted and then dispersed in anhydrous corn sugar. Their advantages are: 1. They can be standardized to a known strength; 2. They are sterile, and do not become infested; 3. They are uniformly distributed throughout the food to be flavored, whereas natural spices are not.

(Recent clinical tests tend to show that the natural spices, because of their high concentration in certain areas of the food, are undesirable for many people. These same persons are able to tolerate soluble spices very well.)

3. Locked-in spices are the extracted resins which have been locked in by a process developed by industry, and they usually employ some type of gum in the process of spray-drying. Their advantages are: 1. They are sterile; 2. They do not lose strength on standing; 3. They quickly became soluble in food; 4. They are uniformly distributed.

4. Aqueous emulsions were exceedingly popular at one time, but their uses have greatly decreased, and now only a few types are being



How Does Weevil-Cide Stack Up?

In previous issues of this publication we have run a series of informational ads evaluating and comparing grain fumigants. Among other things, we pointed out the 8 basic requirements a grain fumigant should properly fulfill.

It is therefore only fair to ask, "How does Weevil-Cide check (✓) against these 8 basic requirements?" Here's the score:

1. Freedom from undue hazard to life or health under actual conditions of use. ✓
2. Positive warning properties. ✓
3. Non-flammability and non-explosiveness under practical conditions. ✓
4. That the fumigant leave no odor, residue or other harmful effect on the grain. ✓
5. Effectiveness at recommended dosages against both immature and adult insects, thus minimizing or preventing reinfestation. ✓
6. Simple and convenient application. ✓
7. Adaptability to use in widely varying types of grain storage units. ✓
8. True economy, meaning low unit cost for effective results. ✓

In short, Weevil-Cide meets every basic grain fumigant requirement.

What is more, while some other grain fumigants satisfy as many as 5, 6 or even 7 requirements, Weevil-Cide is the only product on the market which satisfies all 8 requirements.

THE Weevil-Cide COMPANY
THE DEPENDABLE GRAIN FUMIGANT
1323 UNION AVE.
KANSAS CITY 7, MO.

used. Although they may be initially standardized and brought to a known strength, they have the following disadvantages: 1. They decompose rapidly, due to the water present; 2. The emulsions frequently break; 3. They cannot be used in cold climates.

5. Non-aqueous emulsions are not in the market at present. A patent is being issued on them in the near future. Their particular usefulness lies in the prevention of deterioration of such products as oil of lemon and oil of orange.

Use of Sugar

6. Fruits and fruit peels are often preserved through the use of sugar, which adds another distinct flavoring item to our list. Candied orange peel, citron and ginger are samples of such products.

7. Fruit crystals. These are natural fortified products, available in flavors such as orange, pineapple and blueberry. They are used in cakes, cookies, icings and puddings. Their moisture content is low; therefore, they are very stable.

8. Alcohol extracts are simply solutions of certain oils or resins, and have been used in the home many years. The most familiar are vanilla and lemon extract. The chief advantage of alcohol extract is that the flavoring ingredient is dilute enough for the housewife to measure and use accurately. During the period of Prohibition these extracts furnished satisfaction to many a habitual drunkard.

The subtleties of flavorings cannot yet be checked in the laboratory. Final judgment as to which ingredients and which flavorings are suitable is something which can be reached only through experience in testing and sniffing. In the last analysis, each manufacturer must rely upon the senses of taste and smell shown by individual taste panels and consumer surveys.

Most of our learning and knowledge is gained through the sense of sight. It is the sense of smell, however, which is said to evoke more memories than any other sense. For instance, the scent of new-mown hay or burning leaves may take you back to your boyhood home more readily than a picture of the house in which you lived. The aroma of pine mingled with the oven fragrance of a roasting turkey will remind you of Christmas even as you read about them. A pleasant recollection of our food tends to improve our sense of well-being. It not only stimulates our appetites but improves the digestion of food already eaten. Flavor is the subtle ingredient which accomplishes these miracles.

Some people are color-blind; so, too, some individuals are almost devoid of the senses of taste and smell. It is no wonder then that in the modern rush of life, they just gulp their food. To those persons, we bring a wish from Montaigne's Essays:

> "I do not know who it was in olden times wished his throat was as long as a crane's neck, so that he might the more leisurely taste what he swallowed."

ACKNOWLEDGMENTS:

In addition to the acknowledgments already made in the text, we wish to extend our thanks to Dr. Aladar Fonyo of the William J. Stange Co., to Dr. Jack M. Wenneis of Norda Essential Oil and Chemical Co., to Eli Rosenbaum and Ray Vashro of David Michael & Co., Inc., and to all others who have assisted us in the preparation of this paper.

BIBLIOGRAPHY

Hackh, I. W. D.—Chemical dictionary, American and British usage; 3 ed., completely rev. and ed. by Julius Grant; Blakiston Co., Philadelphia (1946).

Moncrieff, R. W.—The chemical senses, John Wiley & Sons, N.Y. (1944). Taste and smell, pp. 1-2. Structure of the chemical sense organs and their connections, pp. 21-34. Gustation: The four tastes, pp. 95-126. Classifications of odors, pp. 166-72. Chemical constitution and odor, pp. 173-235. Taste and constitution, pp. 236-235. Theories of odor, pp. 298-316. Flavor and food, pp. 349-362. Glossary—Aroma, p. 363; flavor, p. 367.

Jacobs, Morris B.—The chemistry and technology of food and food products; pp. 15-16, Interscience Publishers, N.Y. (1951).

Reindollar, William F.—Flavor and aroma (tastes and odors) in Jacobs, M. B. The chemistry and technology of food and food products, pp. 631-3; Interscience Publishers, N.Y. (1951).

Cohen, Harry, Ph.D.—Foods, flavors and aromatics; American Perfumer and Essential Oil Review (July, 1956).

Lakritz, David E.—Flavor — Essence of Food; flavors, food preferences, the senses of taste, smell and touch; the Spice Mill (June, July and August, 1948).

Flavors interest food chemists; Chemistry 23, 4: 34-6 (December, 1949).

Jacobs, Morris B.—Recent developments in flavors; Am. Perfumer & Essent. Oil Rev. 60:485-6 (1950).

Jacobs, Morris B.—Synthetic food adjuncts, pp. 58-68, D. Van Nostrand Co., N.Y. (1947).

Benezet, L. — Synthetic aromatics for foods; Am. Perfumer & Essent. Oil Rev. 62: 267-76 (October, 1952).

Lakritz, David E.—Spices and flavors; The Flavor Field Section of Coffee and Tea Industries (November, 1951).

Crocker, Ernest C.—Flavors and spices; Encyclopedia of Chem. Technol., 6:581-94 (1951).

Lakritz, Dr. William — Anti-oxidizing agents tested for lemon, orange oil preservation; The Manufacturing Confectioner (September, 1943).

Flavor — Keeping it where it belongs; Bakers Weekly, 133, 10:73-4 (March 10, 1947).

Crocker, E. C.—Basic principles of flavor retention in foods; Proc. Inst. Food Technol., 1944: 80-6.

Lakritz, David E.—Concentrated citrus oils; Drug and Cosmetic Industry (October, 1948).

Hening, J. C.—Methods of measuring flavor quality in food products; Sci. Monthly, 69:130-3 (August, 1949).

Cartwright, L. C., and Kelley, P. H.—Sharper flavor ratings with improved profile test; Food Eng., 23:71-3, 215 (September, 1951).

Flavor profile tests evaluate flavorings in the finished product; Food Processing, 12, 8:17-18 (August, 1951).

Harries, J. M.—Sensory tests and consumer acceptance; J. Sci. Food Agr., 4: 477-82 (1953).

U.S. Department of Agriculture, Agricultural Research Administration, Bureau of Human Nutrition and Home Economics—Experimental procedure for conducting taste and smell tests.

Cairncross, S. E., and Sjostrom, L. B.—Flavor profiles—a new approach to flavor problems; Food Technology 4: 308-11 (1950).

Cairncross, S. E., and Sjostrom, L. B.—What makes flavor leadership? Food Technology 7:56-8 (1953).

Cameron, A. T.—The taste sense and the relative sweetness of sugars and other sweet substances; Sugar Res. Foundation, Scientific Report Series, 9 (December, 1947).

Clark, Edward C., and Dodge, Henry W.—Extraolfactory components of flavor; American Perfumer, 67, 2:67, 69, 70 (1956).

Crocker, E. C.—Flavor; Fifth Edition, N.Y. McGraw-Hill Book Co. (1945).

Crocker, E. C.—Seeking a working language for odors and flavors; Industrial Eng. Chem., 27:1225-8 (1935).

Crocker, E. C.—Volatility in food flavor; Industrial Eng. Chem., 37:214-16 (1945).

Fourman, Victor G. — Relation of odor and flavor; American Perfumer, 67, 1:25-7 (1956).

Girardot, Norman F., and Peryam, David R.—Does pepper contribute to food preference? Food Technology, 7:205-7 (1953).

Jacobs, Morris B.—Variability in taste response; American Perfumer, 66, 5:48-50 (1955).

Kulka, Kurt—An analysis of flavor aromatics; Am. Perfumer & Essent. Oil Rev., 61:149, 151, 153, 167 (1952).

Parry, J. W.—The spice handbook; N.Y. Chemical Publishing Co. (1945).

Peryam, David R., and Girardot, Norman F.—QM pins food "likes" and "dislikes" with advanced taste-test method; Food Engin., 24:58-61, 194 (July, 1952).

Peryam, David R.—Some theoretical and practical considerations in conducting a flavor quality control program.

Prescott, Samuel C., and Proctor, Bernard E.—Spices and condiments; Food Technology, pp. 596-609, N.Y. McGraw-Hill Book Co. (1937).

Winton, Andrew L., and Winton, Kate Barber—Structure and composition of foods; Part III, Spices and Extracts, 4:177-461 (1939).

Wood, Kenneth R., and Peryam, David R.—Preliminary analysis of five army food preference surveys; Food Technology, 7: 248-9 (1953).

Worrell, Lee—Flavors, spices, condiments and essential oils; Jacobs, M. B., Chem. & Tech. of Food and Food Products, pp. 1796-38, N.Y. Interscience Publishers (1951).

EMPTY CARS — FASTER — SAFER

BROOKS CONVERSION KIT
Eliminates the old fashioned, dangerous rope and weight system of operating the tripping mechanism of automatic shovel machines.

BROOKS SHOVEL HOOKS
Save time, money, accidents. Chain can't drop out of hook. Yet hook opens easily with slight hand pressure.

Write for FREE Folder and Prices

The FOSTER & FELTER Company
1908 Grand Avenue, Kansas City 8, Mo.

Larvacide

CHLORPICRIN—THE SAFER FUMIGANT
For General or Spot Mill Fumigation

Fast • Easy • Effective • Economical

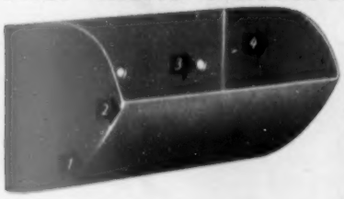
Kill include egglife and larvae; destroys rodents, without carcass nuisance. Cylinders 25-180 lbs. or handy 1 lb. bottles.

Also Available Pressure Dispensed

Write for Literature

Larvacide Products, Inc.
117 Liberty St., New York 6, N. Y.
1515 Third St., San Francisco, Cal.

First Choice Wherever Grain is Handled



Your jobber has them, or write B. I. Weller Company, 327 South LaSalle Street, Chicago 4, Illinois.

(1) The logarithmic curve design loads easier . . . dumps cleaner . . . permits high speeds.
(2) Scientifically formed lip ends in greater cup capacity.
(3) Bolt-hole placement gives better cup balance . . . saves belting.
(4) Hyperbolic sideboard ends permit greater load capacity without "slopping."

CALUMET CUPS

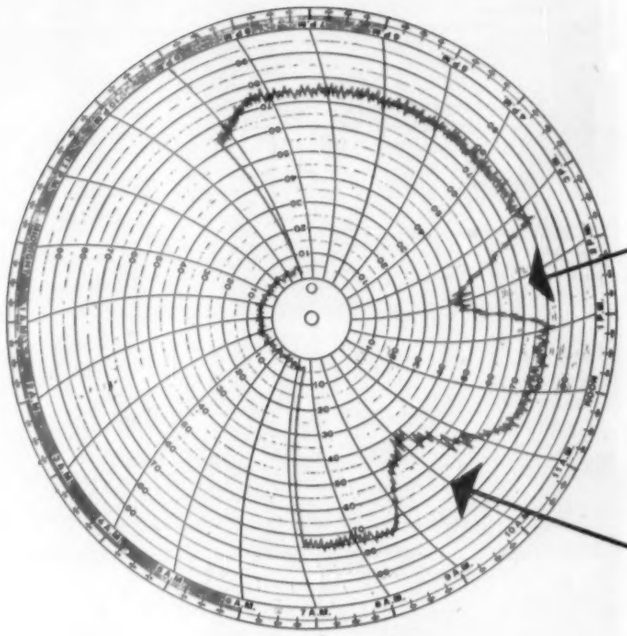
CHECKERBOARD ELEVATOR CO.
MILLING WHEAT • COARSE GRAINS • MILLFEED
Hard and Soft Winter Wheat
ST. LOUIS • KANSAS CITY • MINNEAPOLIS • DENVER • BUFFALO

GRATON AND KNIGHT
G&K INDUSTRIAL LEATHERS
GRATON & KNIGHT Company
WORCESTER, MASSACHUSETTS

Need New Rolls?

In addition to our roll corrugating and grinding service for the flour milling industry, the Twin City Machine Co. also supplies new rolls, and we will be pleased to receive your inquiries.

TWIN CITY MACHINE CO.
Roll Corrugating and Grinding New Rolls
527 Second Avenue, S.E. Minneapolis Minn.



these mean trouble...

IT MIGHT BE a broken belt, a torn sieve, or a choke-up somewhere in the spouting.

But... no matter *what* causes the flow variation in the flour stream ... it's spotted the INSTANT it happens. One look at the graphic recorder operated from the W&T Massometer or Merchen Scale Meter tells the story. Even the smallest momentary fluctuations in flow rate are detected immediately and recorded accurately by these mill "watch dogs."

W&T Massometers and Merchen Scale Meters provide a continuous record — *by weight* — of actual mill performance. They tell you the *exact* flow rate of your streams and they pinpoint time and production losses.

Guaranteed to 1% accuracy, the Massometer will handle flour flows up to 200 pounds per minute... the Merchen Scale Meter, up to 600 pounds per minute. For other applications the Meter will handle flows up to 3000 pounds per minute. Both instruments have been tested and proved highly dependable in hundreds of installations throughout the country.

For complete information, write us today or communicate with your nearest W&T representative.

Massometer

Merchen Scale Meter

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

M-10

Because various grains differ in length

You can make exact separations

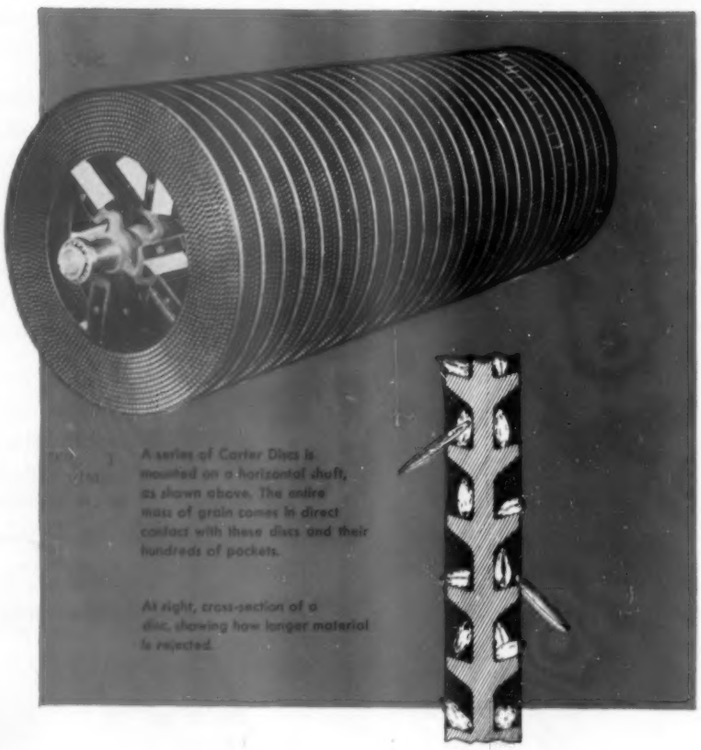
SOME GRAIN IS LONG

SOME IS MEDIUM

SOME IS SHORT

MANY grains are almost identical in width or thickness and would be difficult to separate if it were not for marked differences in their *lengths*. Oats, for example, are longer than wheat; cockle, on the other hand, is shorter than wheat. Because of these length differences, the Carter Disc Separator can make *exact* separations. By means of Carter Discs, which contain hundreds of undercut pockets, the grains or seeds are selected or rejected according to length. As the discs revolve through the grain or mixture, the pockets lift out the material they are designed to carry, and positively reject anything longer.

Take advantage of this accurate method of length separation. Install Carter Disc Separators now!



A series of Carter Discs is mounted on a horizontal shaft, as shown above. The entire mass of grain comes in direct contact with these discs and their hundreds of pockets.

At right, cross-section of a disc, showing how longer material is rejected.

CARTER DISC SEPARATOR

HART-CARTER COMPANY

673 Ninteenth Avenue N. E., Minneapolis 18, Minnesota

Engineers and manufacturers of grain cleaning machinery